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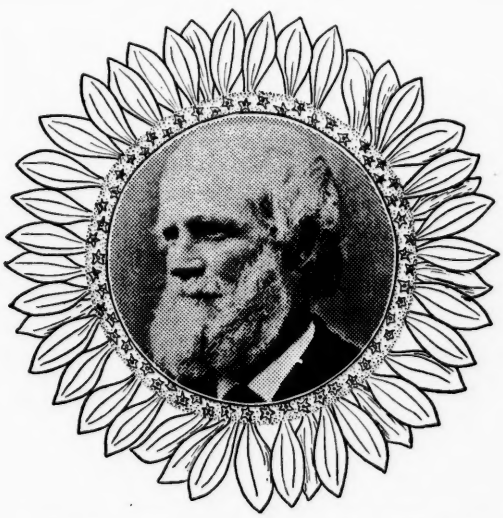

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NOTES ON THE 17-YEAR CICADA IN KANSAS

BY

*R. H. BEAMER, Lawrence, Kansas.**

Brood IV of the 17-year Cicada has been recorded in Kansas since 1845. The Bureau of Entomology at Washington, D. C., mentions this first appearance merely as in the "Northeast part." The records have become more complete with each succeeding appearance until they included 30 counties in 1913, and in 1930 approximately the entire eastern third of the state, reaching as far west as Saline County. The accompanying map shows the distribution of Brood IV in 1930.**

Distribution by Counties of Brood IV in 1930.

* Contribution from the Department of Entomology, University of Kansas.

** Thanks are due Doctors Hyslop and Wadley of the U. S. Bureau of Entomology for the information on which this map is based.

The appearnce of this brood was awaited eagerly by the writer since it was his first opportunity to study the biology of the adult 17-year cicada. Two problems were of especial interest: first, a study of the composition of the brood to obtain biological evidence, if possible, that it was composed of two distinct species, and second, to check, with large numbers, biological data obtained in former studies on camparatively few specimens.

The literature studied gave the impression that the brood was composed largely of **Magicicada septendecim** (Linn.) and usually contained a few specimens of the so-called variety **cassinii** (Fisch). It was, therefore, a surprise to watch the emergence of great numbers daily in timbered localities near Lawrence, Kansas, and find the brood to be exclusively **cassinii** (Fisch.). On a survey trip into extreme northeastern Kansas, **M. septendecim** (Linn.) was found only in small localities in Leavenworth County, Wyandotte County, and Atchison County. The habitat in each case was upland timber or hills covered with perennial shrubs and even in these localities **cassinii** (Fisch.) was often the more abundant of the two. **M. septendecim** (Linn.) was fairly numerous in the oak covered hills in Anderson County, and in similar habitats in Montgomery County, but in the surrounding lowlands, such as the timber bordering streams, **cassinii** (Fisch.) alone occurred.

In but one locality visited during a thousand miles of travel by auto in eastern Kansas, did **M. septemdecim** (Linn.) appear in far greater numbers than **cassinii** (Fisch.). The oak covered hills near Linwood in Leavenworth Co., Kansas, on June 7, 1930, appeared to have almost a pure culture of this cicada. The leaves were brown with their bodies and small trees were bent with the weight of them. A few specimens of **cassinii** (Fisch.) were heard but of the hundreds of specimens taken, practically all were **septendecim** (Linn.). The study of this brood led to the conclusion that the composition probably depended on the habitat, one form prevailing in lowland timbers and the other in upland woods.

The two forms taxonomically have always seemed to the author to be good species. The size, color, and genitalia all show consistent differences sufficient to mark any other cicadas as distinct. However, since they have often been classed as varieties and since their oc-

currence has been so phenomenal it was thought that biological evidence should be considered. That obtained during the past season seemed as conclusive as the taxonomic evidence. The following data are offered:

1st. The songs are as entirely different as the songs of any two cicadas known, even of different genera.

2nd. Careful study of a large series of nests led to the estimation that **M. septendecim** (Linn.) placed from 11-21 eggs in a nest with an average of 15 plus, while the nests of **cassinii** (Fisch.) contain from 8-14 with an average of 11 plus.

3rd. The dimensions of the eggs of the two species are in the proportion of 7 to 8 with **M. septendecim** (Linn.) having the larger egg.

4th. Cross mating was never observed even though specimens of both forms were placed in live cages together.

A little consideration of the significance of the above data may be illuminating. In the case of **T. linnei** (S. & G.) and **T. pruinosa** (Say), two forms often occurring together, so alike as to external appearance that no method is yet known of satisfactorily separating living females, the totally different songs have established them as good species. In the case of **T. pruinosa** (Say) and its light colored variety **fulva** Beamer the size and song are identical, the genitalia alike and when caged together the two forms mate interchangeably. Undoubtedly **fulva** Beamer is merely a variety of **pruinosa** (Say).

The fact that cross mating has not been observed either in nature, where both species occurred in great numbers or in captivity when they were placed together would lend force to the argument that they are distinct. Individauls of different species, even of different genera have been known to mate but the writer has no record of these two forms cross-mating.

The size of eggs of a species has been found to be remarkably constant and while it would be absurd to try to classify cicadas by their eggs, still a constant variation in size of eggs between two forms seems of definite importance.

The number of eggs in a nest varies greatly in some species due largely to the texture of the host but when the host is the same and the size and condition of the

twigs are identical, the average number of eggs in two large series would be approximately the same. The only evidence of any close relation between **M. septendecim** (Linn). and **M. cassinii** (Fisch.) then seems to be that both have a 17-year life history and both commonly occur together in enormous broods.

In the light of evidence gained in recent years, (Studies on the Biology of Kansas Cicadidae, University of Kansas, Sci. Bull. Vol. XVIII, No. 2, p 155), the length of life history does not seem to be significant. While the Periodical Cicada still presents the longest life cycle known it is no longer considered to be necessarily the longest. The fact of mere length of life cycle would not seem important in defining the boundaries of a species at this time. As to the occurrence of the two broods together and in such phenomenal numbers with long periods of total absence between, in contrast to the yearly appearance in smaller numbers of most other forms, perhaps an explanation other than relationship may be suggested.

When the first adults emerged locally, two dozen specimens were collected and placed in cheesecloth live cages over convenient tree branches at my home. Such live cages for adults had been used during the past eight years and the method had seemed a fool-proof one. Cicadas had sung, mated, fed, and oviposited in these live cages. Hence, the author was quite unprepared for the shock of finding the cages empty a few hours later. A broken wing or two in the bottom and a few stain-circled holes in the bags gave the clue that birds, ravenous for meat after the long winter of grain food, had helped themselves to a luscious meal. One cheese cloth cage which was placed over a small elm tree in a vacant lot nearby, after 48 hours revealed 52 holes. Numerous other attempts with these early forms met with similar results. The bags were placed near the house, on protected branches very near the ground, sticks were inserted in the bags to hold them rigid, etc., but always within a few hours after placing a new lot of cicadas in the bag, the observer would find it empty. Then cicadas were placed in a screen wire cage 18 inches across by three feet high, over living shrubs. To the amazement of all, the cicadas again disappeared or were found on the ground, broken and crippled. The birds would perch on the sides or top of the cage and pick at the cicadas hard

enough to stun them. They would alight on the ground around the base and reach unbelieveable distances into the cages with their beaks. A bird was never found inside nor were holes made in the screen wire but the cicadas would disappear until no data could be secured even in these rigid cages. As many as six birds have been noted about a container at one time. The weather was cool, often cloudy and rainy, and the cicadas perched persistently on the sides of the cage probably to obtain what sunlight there was. This doubtless added to their hazard. The habit of these earliest specimens of perching on the leaves also made them more conspicuous. Live cages were improvised by placing growing plants in screened windows and confining the cicadas between the glass and the screen. Even here birds would stun the cicadas by striking them and most of the specimens so placed became crippled within a few days by the loss of tarsal segments or even of the entire leg. Finally by placing cheese cloth bags around the screen wire cages sufficient protection was afforded to allow a study of the insects in captivity.

Corroborative evidence of the part the birds play in this earliest emerging of our Kansas cicadas was obtained in the field. Repeatedly after an emergence had been watched in the early morning the observers would return in the afternoon for a study of the behavior of the newly hardened adults. For several days, in fact until the shrubs and grass stems were well covered with exuvia, not a cicada could be found by afternoon and not a song was heard for days after the first ones had emerged. Even with the advent of countless thousands of these "bits of manna" the birds could be seen each morning getting their fill. Later in the day, however, the birds played little part in the drama but seemed actually to leave the scene. In contrast to these earlier experiences, on June 11th, a month after the first adult cicadas had appeared, numerous males and females were placed in cheese cloth live cages on maple trees and suffered no harm from birds.

It seems probable that these experiences with birds during the early part of the emergence, in contrast to the experiences later in the season with this and other forms, might throw considerable light on the phenomenal appearance of the 17-year cicada in such tremendous numbers in marked broods. Is it not logical to conclude

that cicadas emerging at this early season in numbers which would be considered normal for any other species would be completely devoured by the birds so that not a single one would mature and lay eggs to produce a second brood? Only when they occur in tremendous numbers, numbers sufficient to fill the ravenous birds and leave a goodly number besides, do they live to reproduce their kind. This, it seems to me, might also account for the appearance of the two forms, **M. septemdecim** (Linn.) and, **M. cassinii** (Fisch.) in such close proximity that they have frequently been treated as two varieties instead of as two distinct species.

The following additional biological notes may be interesting: The first adults to appear emerged in the early morning, usually being milky white by 8 or 8:30 A. M.; while a week later almost the entire emergence occurred late in the evening, 7 to 9 P. M., and the specimens were fully colored and hardened by morning.

The exact temperature of the day did not seem to affect emergence but it was thought that the general temperature over three or four days did, i. e., a prolonged cool spell stopped or greatly reduced it. Also while all the brood emerged within a comparatively few days, those in a glen protected from wind by steep hillsides and timber and exposed to sun by absence of large trees did begin emerging several days before the ones on upland or in dense shade.

The first cicadas to emerge exposed themselves on the leaves and tops of plants, probably seeking warmth and dryness, later ones remained for the most part on limbs and trunks of trees.

No specimens taken during emergence were observed to mate in captivity and it has generally been considered that the males, at least, are much more apt to mature normally if free for flight for a short time. However, the finding of females with crippled wings in copula with normal males and of similar females ovipositing, would tend to prove that flight is not necessary, at least, in the case of females.

The percent of cases where emergence was not complete or where development after emergence was imperfect was surprisingly high. It was interesting to note also that these crippled or dead forms early disappeared from shrubs and trees giving the impression of a generation of perfect individuals.

THREE NEW SPECIES OF ACINOPTERUS WITH NOTES ON OTHER SPECIES

(Homoptera, Cicadellidae)

BY

PAUL B. LAWSON, Lawrence, Kans. *

Acinopterus fuscifrons n. sp.

A robust brown species, allied to **acuminatus** but with front marked with brown arcs. Length, female, 5.5 to 6 mm.; male 5 to 5.5 mm.

Head distinctly narrower than pronotum; vertex about one-half longer at middle than next the eye, over twice as wide as long, anterior margin very obtusely angulate, rounding with front. Pronotum about twice as long as vertex, over twice as wide as long, anterior and posterior margins nearly parallel. Scutellum distinctly wider than vertex. Elytra moderately long, apices acutely pointed, venation distinct, usually with four or five cross veins between claval suture and first claval vein.

Genitalia: Last ventral segment of female strongly produced medially as in **acuminatus.** Male plates slender, gradually tapered to rounded apices, over half the length of pygofer.

Color: Vertex, pronotum and scutellum brown, tinged with green. Elytra pale brown, veins distinctly margined with fuscous, apical cells fuscous. Front with eight or nine pairs of fuscous arcs, the first pair longest and distinctly visible from above. Underside greenish brown, thorax often darker.

Holotype, male, Hidalgo County, Tex., Aug. 2, 1928, R. H. Beamer. **Allotype,** female, Cameron County, Tex., Aug. 3, 1928, R. H, Beamer, **Paratypes,** eighteen specimens, same localities and collector.

All types deposited in Snow Entomological Collection.

Acinopterus rubrus n. sp.

A reddish species allied to **acuminatus** but with elytra not as acutely pointed. Length, male, 6 to 6.25 mm.

Head slightly narrower than pronotum; vertex strongly produced, nearly twice as long at middle as next the eye, twice as wide as long, broadly rounding with front. Pronotum one-half longer than vertex, over twice as wide as long, anterior and posterior margins parallel.

*Contribution from Department of Entomology, University of Kansas.

Scutellum slightly wider than vertex. Elytra long, strongly exceeding abdomen, apex narrowed but not coming to sharp point as in **acuminatus.**

Genitalia: Male plates finger like, nearly parallel margined, apices rounded, scarcely half the length of pygofer.

Color: Vertex, pronotum and scutellum light brown, strongly suffused with reddish, appearing nearly flesh colored. Elytra dark brown, lighter along costal margin and apex, veins lighter. Underside yellowish, strongly suffused with red, sometimes parts of thorax brown, legs reddish.

Holotype, male, and three paratypes, taken in San Diego County, Calif., July 4, 1929, by R. H. Beamer.

All types deposited in Snow Entomological Collection.

Acinopterus longipennis n. sp.

A yellowish-brown species, allied to **rubrus** but more slender, vertex shorter and elytra distinctly longer. Length, male, 6.5 mm.

Head slightly narrower than pronotum; vertex about one-half longer at middle than next the eye, twice as wide as long, broadly rounding with front. Pronotum one-half longer than vertex, over twice as wide as long. Scutellum about same width as vertex. Elytra unusually long, greatly exceeding abdomen, apex narrowed but not as sharply as in **acuminatus.**

Genitalia: Male plates very long and slender, practically parallel margined, apices rather acute, half the length of pygofer.

Color: Vertex dull yellow. Pronotum greenish yellow anteriorly, brownish posteriorly. Scutellum color of posterior part of pronotum. Elytra dark brown, veins lighter, with lighter areas along costal margin and in apical and anteapical cells. Underside greenish yellow, thorax and coxae brownish in spots, pygofer only suffused with red.

Holotype, male, San Jacinto Mts., Calif., July 21, 1929, R. H. Beamer.

Type deposited in Snow Entomological Collection.

This species is by all odds the longest winged member of the genus. Both this and the preceding species are larger than any other described members of the genus.

Acinopterus elongatus Lawson

This species has hitherto been know only from the

male type. Through the kindness of Mr. E. W. Davis the writer has seen several specimens of this species from Utah. A female of this series is here designated as the **Allotype.** This female has the last ventral segment greatly produced and slightly notched at the tip. It was taken at St. George, Utah, Sept. 18, 1929, by David E. Fox. It is deposited in the Snow Entomological Collection.

Other specimens of this species are at hand from Modena, Lund, and Leeds, Utah; also one specimen from Coconino County, Ariz.

Acinopterus parvulus Lawson

This species was described from a single male taken at Ontario, Calif. The writer now has before him a series of ten specimens of the species taken at Alpine, Calif., July 9, 1929, by R. H. Beamer. One of these is a female and is here designated as the **Allotype** of the species. In this specimen the last ventral segment is moderately produced medially, with a slight apical notch, and without any signs of lateral angles. It is deposited in the Snow Entomological Collection.

The following additional locality records are made available through the study of a large series of specimens sent the writer by Mr. E. W. Davis:

Acinopterus balli Lawson. Las Vegas and Overton, Nev.

Acinopterus catalinanus Lawson. Las Vegas and Overton, Nev.

Acinopterus lactus Lawson. Las Vegas, Nev.

Acinopterus productus Lawson. Las Vegas and Overton, Nev.

Acinopterus brunneus Ball. Glendale, Nev.

The following additional state records are made from specimens recently studied:

Acinopterus acuminatus Van Duzee. Louisiana.

Acinopterus viridis Ball. Texas.

Acinopterus viridis var. **variegatus** Ball. Kansas.

Acinopterus productus Lawson. Texas.

Acinopterus obtutus Lawson. Nevada.

Acinopterus balli Lawson. Texas. Through an error this species is recorded as being described from specimens taken in Arizona. The type specimens were taken at Riverside, Calif.

SOME NEW NEOCOELIDIA WITH NOTES ON OTHER SPECIES.

(Homoptera, Cicadellidae)

BY

PAUL W. OMAN, Lawrence, Kans. *

Internal Male Genitalia

In the following descriptions reference is made to the characters of the internal male genitalia. In these references the terminology used by other writers on Cicadellidae has been followed, with sufficient additions to make distinctions when necessary.

The writer has examined the internal male genitalia of practically every species of the genus **Neocoelidia** G. & B. and finds that the oedagus typically divides into two processes. the ventral one, which carries the ejaculatory duct and is therefore the oedagus proper, and the dorsal one which is accessory in the sense that it does not carry a duct. This accessory process may be of various forms, while the ventral process is long and slender and more or less curved except in the species **N. obscura** Baker, **N. triunata** Ball, and **N. distincta** n. sp. The points of the styles are the caudally projecting tips in which the styles end, the outer one being the farther from the oedagus and next to the wall of the genital chamber.

In the entire genus the genital characters have been very distinct, except in Ball's three species: **ramona, reticulata**, and **orovila,** and here, while only small differences are evident in the genitalia, the species are so distinct externally that there can be no question as to their validity.

Neocoelidia texana n. sp.

A yellow species with a dark brown median longitudinal vitta. Resembling **N. barretti** Baker and **N. beameri** n. sp. but most closely allied to **N. crenulata** Osborn, a tropical species described from Minca, Colombia. Length of male, 4 mm.; female, 5 mm.

Color: General ground color yellow. Apex of vertex with a small black spot, often continuous with the brown median vitta which arises on the disc of the vertex and extends to tip of elytra, indistinctly margined

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* Contribution from the Department of Entomology, University of Kansas.

beyond clavus. Dorsal stripe narrow on vertex, widening gradually to scutellum, slightly sinuate and not at all laterally lobed on vertex, pronotum or scutellum but expanded laterally on middle and apex of clavus and becoming still wider on the corium outside the tip of clavus. Vitta much wider posteriorly than anteriorly on pronotum. Scutellum with a black spot on each lateral margin, just within the dorsal stripe. Elytra yellowish, inner margins brown, tips smoky.

Structure: Vertex well produced, subacute, nearly conical, not margined between front and disc, longer than basal width and one and one-half times as long as pronotum. Pronotum over twice as wide as long, posterior margin angularly concave. Elytra strongly exceeding abdomen. Last ventral segment of female nearly as long as broad, posterior margin slightly concave between rounded lateral angles and middle. Ventral plates of male united, nearly twice as long as basal width, tapering to bluntly rounded apex.

Internal male genitalia: Dorsal process of oedagus reduced to a single, strongly curved, sharply pointed hook. Ventral process slender, curved at base. Styles long, outer point strongly produced and curved, inner point blunt and square.

This species differs from **N. crenulata** Osborn in being smaller and having the dorsal process of the oedagus single, whereas in Osborn's species the dorsal hook of the oedagus is double. It may be differentiated from **N. beameri** n. sp. by the subacute vertex, the single dorsal process of the oedagus and the shape of the markings on the vertex, while **N. barretti** Baker is much larger and differs also in the shape of the dorsal stripe on the pronotum.

Holotype, male; Cameron County, Texas, August 3, 1928, R. H. Beamer.

Allotype, female; Hidalgo County, Texas, July 30, 1928, R. H. Beamer.

Paratypes, two females and one male, Hidalgo County, Texas, July 30, 1928; and two females from Cameron County, Texas, August 3, 1928; R. H. Beamer.

Types deposited in Snow Entomological Collection.

Neocoelidia beameri n. sp.

Lemon yellow with a dark brown to black median longitudinal vitta. Close to **N. barretti** Baker, **N. crenulata** Osborn, and **N. texana** n. sp. Length of male,

4.5 mm.; female, 5 mm.

Color: General ground color yellow; tip of vertex with a small black spot which is often elongate, fused with and appearing as part of the median vitta. Dorsal vitta fuscous, arising on vertex, extending to tips of elytra but indistinctly margined beyond the claval area, distinctly three lobed on vertex, the first pair of lobes often knob-like and the third pair often extending laterocephalad in horn-like protuberances. The stripe gradually widens to the base of the scutellum, incurving slightly on the pronotum but much wider on the posterior margin than the anterior margin, widening distinctly once on the base of the elytra, once on the middle and once at the apex of the clavus and becoming still wider on the corium just beyond the claval area. Scutellum with a black spot on each lateral margin just within, and in darker specimens sometimes obscured by the dorsal stripe. Vitta occasionally bordered by a milky area. Elytra lemon yellow with darker inner borders and smoky apices.

Structure: Vertex moderately produced, obtuse, not at all or very slightly margined between front and disc, slightly longer than basal width and one and one-half times as long as the pronotum. Pronotum over two and one- half times as long as broad, posterior margin angularly concave. Elytra strongly exceeding abdomen. Last ventral segment of female as long as broad, posterior margin truncate, slightly notched at middle. Ventral plates of male united, twice as long as basal width, tapering more sharply on distal half to somewhat pointed apex which exceeds pygofer.

Internal male genitalia: Dorsal process of oedagus double, flat, finely serrate on caudal margin and broadly rounded at tip. Ventral process typically slender. Styles moderately long, outer point long, inner point blunt.

This species may be separated from **N. barretti** Baker by its smaller size and the fact that the dorsal vitta is much wider on the posterior margin of the pronotum than on the anterior margin and has the black spots on the scutellum within the lateral margins of the median vitta. From **N. crenulata** Osborn, a closely related species from Columbia, and **N. texana** n. sp. it may be distinguished by the obtuse vertex, the shape of the lobes of the dorsal stripe on the vertex, and the char-

acter of the dorsal process of the oedagus in the internal male genitalia.

Holotype, male; Cameron County, Texas, August 3, 1928, R .H. Beamer.

Allotype, female; same data.

Paratypes, three males and two females, Cameron County, Texas, August 3, 1928, L. D. Beamer, E. I. Beamer, and R. H. Beamer.

I take pleasure in naming this striking species after Doctor R. H. Beamer, with whom I have spent many pleasant hours in collecting insects.

Types deposited in Snow Entomological Collection.

Neocoelidia fuscovittata n. sp.

A yellowish species with a broad, dark brown, median longitudinal vitta. Close to **N. lineata** Baker but much darker and slightly more robust. Length of male, 5.5 mm.; female, 7 mm.

Color: General ground color yellowish with a dark brown, median longitudinal vitta arising on disc of vertex and extending to tip of elytra, not sharply margined beyond tip of clavus. A small black spot on apex of vertex and one on each lateral margin of scutellum, the latter just within the margin of the dorsal stripe. Elytra subhyaline with inner margins fuscous and apices dusky. Veins of wings darkened. Tergum black.

Structure: Vertex bluntly, obtusely rounded, sometimes slightly angled, distinctly margined between front and disc, as long as basal width and equalling pronotum in length. Pronotum slightly over twice as wide as long, posterior margin either broadly concave or slightly angular. Elytra long as in **N. lineata** Baker. Last ventral segment of female longer than broad, median length exceeding lateral length. Ventral plates of male united, nearly twice as long as basal width, broad basally and tapering on distal half to blunt apex.

Internal male genitalia: Dorsal process narrow and curved on basal two-thirds, broad and flat on distal third, serrate along lateral margins, notched at the tip and ending in two points. Ventral process long, slender, sharply curved at base. Outer point of style curved inward, inner point well produced, curving toward outer point.

Besides differing from **N. lineata** Baker in being much darker and slightly more robust, this species dif-

fers also in having the last ventral segment of the female distinctly longest at the middle, the posterior margin not at all sinuate and unnotched, and in the dorsal process of the internal male genitalia being single and not double and leaflike as in Baker's species.

Holotype, male; Cochise County, Arizona, July 29, 1927, R. H. Beamer.

Allotype, female; Yavapai County, Arizona, August 9, 1927, R. H. Beamer.

Paratypes, four males and eleven females from Cochise County, Arizona, July 29, 1927; Socorro County, New Mexico, August 18, 1927; Grand Canyon, Arizona, August 11, 1927; and Cocconino County, Arizona, August 13, 1927; R. H. Beamer, P. A. Readio, and L. D. Anderson.

Types deposited in Snow Entomological Collection.

Neocoelidia penelineata n. sp.

A greenish-yellow species with a faint, often very faint, brown median longitudinal vitta. Lighter than **N. lineata** Baker and with radius of the hind wings not darkened. Length of male, 6 mm.; female, 6.5 mm.

Color: General ground color greenish yellow, tip of vertex with a small black spot. A faint brownish median vitta arising on vertex and extending across pronotum and scutellum, becoming very faint on elytra. Scutellum with a faint black spot midway on each lateral margin; in specimens that are not fully colored these are not distinct. Elytra subhyaline except inner margins, which are slightly brownish. Wings with posterior veins except radius partially darkened. Terga, except eighth, black, adding to the appearance of a dark median vitta.

Structure: Vertex bluntly rounded, sometimes slightly angular, margined between front and disc, slightly wider than long and exceeding pronotum in length. Pronotum over twice as wide as long, anterior margin rounded, posterior margin angularly concave, distinctly so in male and slightly so in female. Scutellum large, wider than long. Elytra long, strongly exceeding abdomen. Last ventral segment of female longer than broad, posterior margin distinctly sinuate between the middle and the lateral angles, slightly notched at middle, median length equalling lateral length. Ventral plates of male united, twice as long as basal width, broad basally and tapering sharply on distal half, trun-

cate apex equalling pygofer.

Internal male genitalia: Dorsal process of oedagus double, curved and leaflike, serrate along caudal margin. Ventral process slender, curved sharply basally. The oedagus above the point of division is not heavy as in **N. lineata** Baker. Styles short, outer point long, slightly curved, inner point blunt.

This species may be distinguished from **N. lineata** Baker by the fact that the hind wings do not have radius darkened and that it is lighter and decidedly more greenish in color.

Holotype, male; San Jacinto Mts., Calif., July 21 1929, R. H. Beamer.

Allotype, female; Carson City, Nevada, August 9, 1929, R. H. Beamer.

Paratypes, three males; San Jacinto Mts., Calif., July 21, 1929, R. H. Beamer.

Types deposited in Snow Entomological Collection.

Neocoelidia distincta n. sp.

Resembling **N. obscura** Baker in form but with all the veins of the elytra distinct and brown. Length of male 5.25 mm.

Color: General ground color dirty yellow, tip of vertex with a small black spot. Vertex, pronotum and scutellum faintly marked with three parallel lines of orange, broadly joined on the anterior margin of the disc, much as in **N. obscura** Baker. Elytra subhyaline with the veins all dark and brown. Veins of the hind wings dark. Femora and tibiae and occasionally the abdomen faintly tinged with red.

Structure: Vertex obtuse, nearly angular, distinctly margined between front and disc, broader basally than long and equalling pronotum in length. Pronotum over twice as wide as long, anterior margin rounded, posterior margin shallowly, angularly concave. Elytra long, strongly exceeding abdomen. Ventral plates of male twice as long as basal width, united basally but separate at the apex, which exceeds the pygofer.

Internal male genitalia: Dorsal process of oedagus very short and serving as a point of attachment to the genital chamber. Ventral process very wide at base and curved in lateral view, ending in two short lateral pocesses which extend beyond the genital pore. Styles with the outer point blunt and curved, inner point not pro-

duced.

Holotype, male; Arizona, C. U. Lot 34.

Paratype, male from Texas. Both specimens are from the C. F. Baker collection, now in the National Museum at Washington, D. C.

Neocoelidia pulchella Ball

Ball, Ent. News, xx, p. 168, 1909.

This species was declared by Van Duzee (Trans. San Diego Soc. Nat. Hist., ii, p, 56, 1914,) to be a synonym of **N. barretti** Baker. After comparison with specimens from the type series the writer feels certain that **N. pulchella** Ball should be recognized as valid species, as it differs from Baker's species in being larger and in having a more sharply pointed and produced vertex.

Neocoelidia pentagona Ball

Ball, Ent. News, xxvii, p. 207, 1916.

The type and others of the series from which Ball described this species have been compared by the writer with specimens of the type series of Baker's **N. obscura** and found to be identical.

The writer wishes to express his appreciation to Dr. E. D. Ball for the generous loan of the types or specimens of his species. Without these species this study would have been impossible. In addition through the courtesy of Dr. Harold Morrison the material of the United States National Museum was made available for study.

TWO NEW EUPHYLLURA (Homoptera, Chermidae)

BY

RALF S. MARTIN, Lawrence, Kans. *

Hitherto four species of this genus have been known from the United States. Two new species are described in this paper and Crawford's key is revised to include the new species.

Key to Genus Euphyllura.

A. Vertex very deeply emarginate over insertion of antennae, with a prominent. rounded projection between emargination and front margin of eye; wings strongly rhomboidal.

B. Wings much lighter in color than rest of body.

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*Contribution from the Department of Entomology, University of Kansas.

C. Wings snow white, apparently covered with very fine white powder **neveipennis** Schwarz

CC. Wings creamy, not covered with powder **bicolor** n. sp.

BB. Wings of about same color as rest of body.

C. Wings rather light in color, entire surface dotted with small brown spots, and covered with coarse, waxy granules **pruinosa** n. sp.

CC. Wings usually reddish brown, without waxy granules **arctostaphyli** Schwarz

AA. Vertex not emarginate over antennal insertion, or if so, not deeply; prominent projection wanting; wings rhomboidal, but not strongly so.

B. Forewing bicolored, brown basally and light apically; forceps of male very slender, emarginate near apex on front margin, without tooth on hind margin; genal lobes moderately long **arbuti** Schwarz

BB. Forewings uniformly brown; forceps of male rather stout, not emarginate at apex, with a distinct tooth on posterior inner margin about one-third the length from apex; genal lobes short **arbuticola** Crawford

Euphyllura pruinosa n. sp.

A whitish species with thorax strongly marked with brown and with many small brown dots on wings.

Length to tip of folded wing 2.8. to 3.5 mm,; length of forewing 2.15 to 2.85 mm.; length of body of female 2.5 to 2.75 mm.; length of body of male 1.8 to 2.2 mm; width of head 1.0 to 1.15 mm.

Vertex and genae creamy, with bright red dots scattered over both. Median line of vertex sharply cut and usually deep red. Vertex and genae both pubescent, pubescence longer and denser on latter. Ocelli and foveal impressions bright red. Strongly receding compound eyes with basal creamy-yellow color but many facets red or brown, giving entire eye rather dark appearance. Prothorax creamy yellow, marked with few bright red and light brown dots and splotches. Mesothorax yellow, with red dots, disc brown. Metathorax striped with five yellow and four brown stripes. Forewing white, its entire surface pubescent and covered with tiny brown dots of uniform size; venation as in **arctostaphyli.** Entire surface of genae, vertex, thorax and wings covered with coarse waxy granules. Male

and female external genitalia as in **arctostaphyli.**

Holotype, male, San Diego County, Calif., July 4, 1929, R. H. Beamer. **Allotype,** female, Laguna Mts., Calif., July 6, 1929, R. H, Beamer. **Paratypes,** 30 specimens, with above data.

A pair of paratypes deposited in the United States National Museum; all other types in Snow Entomological Collection.

Euphyllura bicolor n. sp.

A large red and cream colored species.

Length to tip of folded wing 3.5 to 4.1 mm.; length of forewing 2.8 to 3.5 mm.; length of body of female 2,8 to 3.25 mm.; length of body of male 2.35 to 2.5 mm.; width of head 1.18 to 1.3 mm.

Vertex and genae the color of watery blood with small and deeper red spots unevenly distributed over surface. Genae pubescent; vertex glabrous. Entire thorax deep blood red and glabrous. Wings very distinctive, being large in comparison with those of other species; light cream colored. Pro- and mesothoracic femora deep red; tibiae and tarsi yellow. Entire metathoracic leg and abdomen yellow. Male genitalia similar to **arctostaphyli** in many respects except that oval valve narrows distinctly toward tip and at extreme tip backward projecting portion is much more prominent. Female genitalia very similar to **arctostaphyli.**

Holotype, male, Alpine, Calif., July 9, 1929, R. H. Beamer. **Allotype,** female, same data. **Paratypes,** twelve specimens, same data.

A pair of paratypes deposited in United States National Museum; all other types in Snow Entomological Collection.

THE CHINCH BUG AS A RICE PEST [1]

By DWIGHT ISELY and WILLIAM R. HORSFALL
Department of Entomology, University of Arkansas

The chinch bug has a well established reputation for destructiveness to wheat and corn, particularly during a succession of dry seasons. It may not seem plausible, therefore, to refer to it as an insect injurious to a water-loving crop like rice, even though the injury, while it may be severe, is always local. Damage to this

1 Research Paper No. 231, Journal Series, University of Arkansas.

crop, however, does not indicate any change in the habits or susceptibilities of the pest. The damage occurs only when rice fields are not flooded, that is, early in the season before flooding, and late in the season after drainage preparatory for harvest. It is most pronounced when drouth occurs in successive seasons, thus favoring the increase of bugs in adjacent grassland.

Damage to young rice by chinch bugs, in the early part of the season before flooding, has been noted before by Ingram [2]. Such damage most frequently occurs in June. In some cases the rice plant, like corn, serves the role of the second host plant for the spring generation, the immature bugs migrating into the rice fields from adjacent grassland or oat fields. Over-wintered chinch bugs may also lay eggs in young rice, but the bugs which hatch within the field seldom develop rapidly enough to cause serious injury before flooding, unless flooding is delayed beyond the average time. The type of injury to young rice is similar to chinch bug injury to other of the small grains, that is, the leaf blades turn yellow or brown and shrivel. At a distance, fields attacked have a burned appearance.

In heavily infested spots the chinch bug frequently destroys the entire stand of rice, but the area of such spots is seldom greater than a few acres. The total reduction in yield of rice in Arkansas probably never exceeds one per cent, and will average much less than that. Ingram has listed the chinch bug among the minor insect pests of rice.[3] The extent of injury he indicated in the Insect Pest Survey in 1925,[4] when he reported that the stand of rice on 500 acres of unflooded rice in Arkansas County was destroyed by chinch bugs, and that the acreage injured was much greater. Severe local injury by bugs of the first generation was noted in 1924 and 1925, and again in 1930.

The second type of injury, that is, to rice in head, was observed in the late summer of 1930, after water was removed. As the fields dried, chinch bugs swarmed in from adjacent grasslands. They attacked the plant stems at the nodes and under the leaf sheaths. They

2 Ingram, J. W. Insects injurious to the rice crop. U. S. D. A. Farmers' Bul. 1543, 16 p., 15 figs. *B. leucopterus*, p. 14-15. 1927.

3 l. c.

4 Insect Pest Survey. 5: 203. 1925.

were particularly conspicuous in clusters below heads. The result was that the heads were blasted in a very short time and little or no grain developed. The empty heads were not pendant, as is characteristic of those heavy with grain, but remained upright as in the "straight-head" disease. At a distance the injured areas in rice fields could be distinguished readily by their white color.

No extensive injury of this type was observed. In one case about five acres of an eighty-acre field was destroyed. In most cases loss was nearly total as far as the bugs had migrated. In none of the fields under observation did the maximum amount of injury take place, since, as soon as the outbreak came to our attention, the migration of bugs was always stopped by flooding the canals around the fields, or when no such canals were available by flooding the fields themselves.

The chinch bug obviously does not breed in rice fields in the summer as it does in corn. The source of infestation is the uncultivated grassland, and to an extent oats. Such land is nearly equal in area to that in rice. This was shown by a recent survey of 107 typical farms in the rice area, by Hall[5] of the Department of Rural Economics. He found that while approximately 50 per cent of the land was in rice, over 40 per cent was uncultivated (mostly growing in wild grass), and in grass meadows or in oats. The bunch grasses growing on the uncultivated land furnished ideal situations for hibernation. Migrations of chinch bugs from grasslands to rice differ from migrations from wheat to corn, in that they are more gradual. This is because the migration is not forced by the cutting of a crop.

Flooding of rice doubtless prevents the chinch bug from becoming a generally distributed pest of rice. It is the most obvious measure for control after chinch bugs have invaded a field. From the point of view of water economy, it may not be desirable to do this on young rice as early as the migration of the bugs necessitates. This is true particularly with rice on new land, on which flooding is usually delayed beyond the average time.

The late season injury is in some respects more difficult to prevent, since the fields must be drained

5 Hall, O. J. Rice farming in Ark. .. Ark. Exp. Sta. Bul. 260. 1931.

and the ground thoroughly dried before harvest. However, in dry seasons like 1930, this situation can be met by burning over chinch bug infested grassland, or idle land adjacent to rice fields, about a week before drainage is necessary. The bugs which escape burning are thus forced to migrate early, and can be destroyed before damage is possible.

SIXTH ANNUAL MEETING OF THE KANSAS ENTOMOLOGICAL SOCIETY

BUSINESS MEETING

Pres. H. B. Hungerford called the Kansas Entomological Society meeting to order at 10:25 a. m., in Room 53, Fairchild Hall, K. S. A. C., Manhattan, Kansas, on March 22, 1930.

Motion made that the secretary's report of the Fifth Annual Meeting of the Society be accepted. Motion was carried.

Report of treasurer. Subscription lists of Volumes I, II, and III of the Journal of the Kansas Entomological Society were summarized as to the financial return and also the return from printing separates. A surplus beyond running expenses has been placed in a savings account in the First National Bank, Manhattan, Kansas.

Motion made to accept report. Motion carried.

The Executive Committee of the Society made a report of the announcement of place of meeting of the Kansas Academy of Science at Hays State Teacher's College, Hays, Kansas, on April 18 and 19, 1930. The special speaker for this meeting to be Prof. T. D. A. Cockerell of Colorado University. The secretary of the Kansas Entomological Society was approached by officers of the Kansas Academy of Science in regard to merging the Journal of the Kansas Entomological Society with the Proceedings of the Kansas Academy of Science. The Kansas Entomological Society is decidedly not in favor of such action.

Report of the committee on the publication of the Rocky Mountain Entomological Conference which is held in Pingree Park, Colo. It was thought that about half an issue could be devoted to the publication of the summary of this conference. The Conference Committee felt that if possible they would continue the publication of the summary in mimeograph form. P. M. Gilmer

suggested that about two pages of general notes in each issue be spread out in the Journal. Considerable discussion was brought out on this subject by Messrs. Hungerford, Parker, Lawson, and Dean. A motion was made that the Rocky Mountain Entomological Conference summary be included in the Journal if the Conference Committee so desired. Motion carried.

President Hungerford appointed the following committees:

Resolutions—P. B. Lawson, P. M. Gilmer Bernard Liston
Nominations—R. H. Painter, K. Doering, E. G. Kelly.

The secretary made a report on the extensiveness of the subscription lists of Volumes I, II, and III of the Journal of the Kansas Entomological Society.

P. B. Lawson, Chairman of the Editorial Committee and Editor of the Journal of the Kansas Entomological Society, made a report on the work of certain members in the production of the Journal of the Kansas Entomological Society. He praised the work of J. W. McColloch, former editor, W. Knaus, the publisher, and R. L. Parker, the secretary-treasurer.

The editor requested the treasurer to explain the policy of the Publication Committee and Executive Committee on reprinting of papers and their prices.

AFTERNOON SESSION

Papers were presented as follows:

Notes on Scolops	P. B. Lawson
Notes on a Vespa Nest	A. W. Lindquist
A Mite on Snakes	H. E. Skoog and H. Smith
Notes on Cicadas in 1929	R. H. Beamer
Xanthium (cockleburr) and its Insects	S. G. Kelly
Tree Tanglefcot Bands as Insect Collectors	F. H. Walker
Biological Notes on Gyrinidae	F. Gray Butcher
Pink Boll Worm in Haiti	Andre Audant
Notes on Bedbugs	P. A. Readio
Mediterranean Fruit Fly in Florida	Geo. A. Dean
Notes on Kansas Cuterebra	R. H. Painter

FINAL BUSINESS

The Resolutions Committee presented the following resolutions:

Your Committee on Resolutions begs leave to submit the following resolutions:

1. That the Kansas Entomolocical Society heartily

appreciates the courtesy and generous entertainment afforded it by the Department of Entomology of the Kansas State Agricultural College at this meeting.

2. That the Society hereby instructs its secretary to send to Dr. Warren Knaus its regrets at his absence here today, its best wishes for his speedy return to health, and express to Dr. Knaus its sincere thanks for his splendid services in the publication of the Journal of the Society.

3. That the Society hereby expresses a sense of its lasting loss in the death of Prof. J. W. McColloch. Professor McColloch was a man loved for the simplicity and integrity of his character, honored for his ability, friend of us all. More than any other he helped to establish the Journal of our Society and was its efficient editor for two years—until the time of his death. As a Society we owe him a great debt, and as individuals we can never forget him.

Be it further resolved that this resolution be spread upon the records of the Kansas Entomological Society and that a copy be sent to Mrs. McColloch.

Respectfully submitted,
Paul M. Gilmer
Paul B. Lawson
Bernard Liston

Motion made that these resolutions be accepted. Motion carried.

The report of the Nominations Committee is as follows:

President ..... Geo. A. Dean
Vice-president ..... R. H. Beamer
Sec'y.-Treas. ..... R. L. Parker
Member of Publication Committee, Roger C. Smith

Motion made that the secretary cast the ballots electing the above officers. Ballots cast and officers elected.

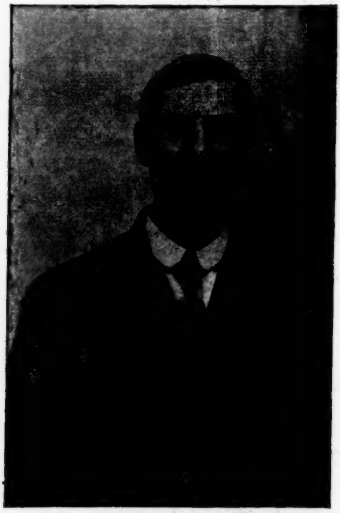
Motion made that the Kansas Academy of Science elect a member of their Executive Council from the Kansas Entomological Society. Motion carried.

Motion made that the time and place of the next annual meeting be left with the Executive Committee of the Society. Motion carried.

There were 41 members and friends in attendance.

Adjourned at 4:50 p. m.

R. L. PARKER, Secretary.



FERDINAND F. CREVECOEUR

Ferdinand F. Crevecoeur, an amateur entomologist and naturalist who has been the source of many insect records from Onaga, Kansas, died suddenly on April 7, 1931. He was buried in the Onaga cemetery. Mr. Crevecoeur was born at Chicago, Ill., June 23, 1862. Following the death of his father, he, in April, 1870, came with his mother to live on a farm near Onaga, Kansas, where he lived until his death. He remained a bachelor and lived alone after his mother's death in 1908. A United States Department of Agriculture Yearbook came into his possession, which opened up to him the field of biological science and geology. He had much correspondence with officials of the U. S. Department of Agriculture, who gave him much encouragement. The U. S. Department of Agriculture, the Smithsonian Institution and the National Museum sent him their publications in the biological fields. To these services and the Kansas Academy of Science he gave the major credit for his technical knowledge and encouragement.

In 1917, Mr. Crevecoeur gave practically all of his natural history collection to Ottawa University, at Ottawa, Kansas. As an amateur, he published quite extensively. There have been published several more or less popular articles in the Onaga Republican, one article in Entomological News, 1903, and nine articles in the Transactions of the Kansas Academy of Science (1903-1922). A biography and also a bibliography has been prepared by Dr. Roger C. Smith for publication in the Transactions of the Kansas Academy of Science.

R. L. PARKER.

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